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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,394	03/09/2004	Takuya Tsukagoshi	890050.468	1892

500 7590 02/21/2008

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ART UNIT	PAPER NUMBER
2872	

MAIL DATE	DELIVERY MODE
02/21/2008	PAPER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/796,394
Filing Date: March 09, 2004
Appellant(s): TSUKAGOSHI, TAKUYA

Ronald Stern (59,705)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed November 13, 2007 (11/13/07) appealing from the Office action mailed March 13, 2007 (3/13/07).

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

In view of the granting of a petition to request entry of an after-final amendment filed 7/25/07, the amendment after final rejection filed on 7/25/07 has been entered.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct.

Appellant's brief presents arguments (See Pages 15-16 of Appellant's brief filed 11/13/07) relating to the non-entry of an after-final amendment filed 7/25/07. This issue relates

to petitionable subject matter under 37 CFR 1.181 and not to appealable subject matter. See MPEP § 1002 and § 1201.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

In view of the granting of a petition to request entry of an after-final amendment filed 7/25/07, the copy of the appealed claims contained on Page 19 of the Appellant's brief filed 11/13/07 is the proper set of claims under appeal.

(8) Evidence Relied Upon

Chou, W., Neifeld, M. A., "Interleaving and error correction in volume holographic memory systems", Applied Optics, vol. 37, no. 29 (Oct 10, 1998), pp. 6951-6968

6,163,391	CURTIS et al.	12-2000
6,301,028	TANAKA et al.	10-2001

Bernal, M., Burr, G. W., Coufal, H., Quintanilla, M., "Noise in high-areal-density holographic data storage systems", Opt. Soc. America, Washington, DC, USA (May 1998), pp. 21-22

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-3 are all rejected under 35 U.S.C. 103(a). These rejections are set forth in the prior Office Action dated 3/13/07, and copied *infra*.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. (W. Chou, M. A. Neifeld, 'Interleaving and error correction in volume holographic memory

systems', Appl. Opt., vol. 37, no. 29, October 10, 1998, pp. 6951-6968.), of record, in view of Curtis et al. (U.S. Patent No. 6163391), of record, and Bernal et al. (M. P. Bernal, G. W. Burr, H. Coufal, M. Quintanilla, 'Noise in high-areal-density holographic data storage systems', Opt. Soc. America, Washington, D.C., USA, May 1998, pp. 21-22.), of record.

Chou et al. discloses a holographic recording and reproducing apparatus (See for example Figure 1; Section 2A) for recording data as phase information of light in a holographic recording medium (See 'memory' in Figure 1) by projecting a signal beam and a reference beam thereonto, the holographic recording and reproducing apparatus comprising at least a spatial light modulator (See 'SLM' in Figure 1), a Fourier transform lens (See 'lens 1' in Figure 1), a reverse Fourier transform lens (See 'lens 2' in Figure 1), and a CCD image sensor (See 'CCD' in Figure 1), the holographic recording medium being disposed between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform lens is set to be different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of information). Chou et al. lacks a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens. However, Curtis et al. teaches a conventional method and apparatus for holographic data storage (See for example Figures 1, 15),

wherein the holographic recording medium (See for example 30 in Figure 1; 520 in Figure 15) may be located away from the focal point of the incident Fourier transform lens (See for example Figures 6-7, 10-11, 13-14). This repositioning of the focal point of the Fourier transform lens may be performed by positioning the recording medium away from the focal point of the Fourier transform lens (See for example Figure 13) or by utilizing additional powered lenses (See for example 390/395 in Figure 10; 405 in Figure 11) in conjunction with the Fourier transform lens to adjust the convergence or divergence of the incident light beam (See col. 10, line 1-col. 12, line 29). Further, the lenses, including both the Fourier transform lens and the inverse Fourier transform lens as well as the power optic (See Figures 6-7, 10-11, 13-14) do not move prior, during, or after the recording and reproduction of information, and thus the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens remain unchanged during the recording and reproduction of the information. In addition, Bernal et al. teaches a digital holographic storage system utilizing a 4F lens design (See Figure 1), wherein an aperture is placed at the Fourier plane of the 4F system (it is noted that this Fourier plane occurs at the confocal point of the Fourier (See L1 in Figure 1) and reverse Fourier (See L2 in Figure 1) lenses at point 'D'). Also, the Fourier and inverse Fourier transform lenses (See L1, L2 in Figure 1) of Bernal et al. do not move prior, during, or after holographic recording and reproduction of information. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the apparatus of Chou et al. further comprise a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and

the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, as taught by Curtis et al. and Bernal et al., for the purpose of 1) minimizing the sensitivity of the holographic recording medium to shrinkage due to curing or temperature changes and 2) minimizing crosstalk noise.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. in view of Curtis et al. and Bernal et al.

Chou et al. in view of Curtis et al. and Bernal et al. discloses the invention as set forth above, except for the focal length of the reverse Fourier transform lens being set longer than that of the Fourier transform lens. However, since Chou et al. already discloses that the focal length of the Fourier transform lens may be longer than or equal to that of the reverse Fourier transform lens, one of ordinary skill would have also been likely to design a similar holographic recording and reproducing apparatus utilizing an asymmetrical 4F lens design, wherein the focal length of the Fourier transform lens is shorter than that of the reverse Fourier transform lens (i.e. the focal length of the reverse Fourier transform lens is longer than that of the Fourier transform lens), particularly when there is a mismatch in pixel sizes between the SLM and the CCD. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the focal length of the reverse Fourier transform lens be set longer than that of the Fourier transform lens in the holographic recording and reproducing apparatus of Chou et al. in view of Curtis et al. and Bernal et al., for the purpose of optimizing the light throughput of the optical system, while reducing unwanted errors due to optical noise.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. (W. Chou, M. A. Neifeld, ‘Interleaving and error correction in volume holographic memory systems’, Appl. Opt., vol. 37, no. 29, October 10, 1998, pp. 6951-6968.), of record, in view of Tanaka et al. (U.S. Patent No. 6301028), of record, and Bernal et al. (M. P. Bernal, G. W. Burr, H. Coufal, M. Quintanilla, ‘Noise in high-areal-density holographic data storage systems’, Opt. Soc. America, Washington, D.C., USA, May 1998, pp. 21-22.), of record.

Chou et al. discloses a holographic recording and reproducing apparatus (See for example Figure 1; Section 2A) for recording data as phase information of light in a holographic recording medium (See ‘memory’ in Figure 1) by projecting a signal beam and a reference beam thereonto, the holographic recording and reproducing apparatus comprising at least a spatial light modulator (See ‘SLM’ in Figure 1), a Fourier transform lens (See ‘lens 1’ in Figure 1), a reverse Fourier transform lens (See ‘lens 2’ in Figure 1), and a CCD image sensor (See ‘CCD’ in Figure 1), the holographic recording medium being disposed between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform lens is set to be different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of information). Chou et al. lacks a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic

recording medium and the reverse Fourier transform lens. However, Tanaka et al. teaches a conventional apparatus for holographic data storage (See for example Figure 9), wherein the holographic recording medium (See for example 10 in Figure 9) may be located away from the focal point of the incident Fourier transform lens (See for example 13 in Figure 9). Further, in Tanaka et al., a pinhole (See 50 in Figure 9) may be disposed at the confocal point of the Fourier transform lens and the inverse Fourier transform lens (See 21 in Figure 9), such that the pinhole as well as the focal point are disposed between the holographic recording medium and the Fourier transform lens. Further, both the Fourier transform lens and the inverse Fourier transform lens (See 13, 21 in Figure 9) do not move prior, during, or after the recording and reproduction of information, and thus the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens remain unchanged during the recording and reproduction of the information. In addition, Bernal et al. teaches a digital holographic storage system utilizing a 4F lens design (See Figure 1), wherein an aperture is placed at the Fourier plane of the 4F system (it is noted that this Fourier plane occurs at the confocal point of the Fourier (See L1 in Figure 1) and reverse Fourier (See L2 in Figure 1) lenses at point 'D'). Also, the Fourier and inverse Fourier transform lenses (See L1, L2 in Figure 1) of Bernal et al. do not move prior, during, or after holographic recording and reproduction of information. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the apparatus of Chou et al. further comprise a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform

lens or between the holographic recording medium and the reverse Fourier transform lens, as taught by Tanaka et al. and Bernal et al., for the purpose of 1) minimizing the sensitivity of the holographic recording medium to shrinkage due to curing or temperature changes, 2) minimizing crosstalk noise, and 3) maximize storage density of the holographic recording medium.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. in view of Tanaka et al. and Bernal et al.

Chou et al. in view of Tanaka et al. and Bernal et al. discloses the invention as set forth above, except for the focal length of the reverse Fourier transform lens being set longer than that of the Fourier transform lens. However, since Chou et al. already discloses that the focal length of the Fourier transform lens may be longer than or equal to that of the reverse Fourier transform lens, one of ordinary skill would have also been likely to design a similar holographic recording and reproducing apparatus utilizing an asymmetrical 4F lens design, wherein the focal length of the Fourier transform lens is shorter than that of the reverse Fourier transform lens (i.e. the focal length of the reverse Fourier transform lens is longer than that of the Fourier transform lens), particularly when there is a mismatch in pixel sizes between the SLM and the CCD. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the focal length of the reverse Fourier transform lens be set longer than that of the Fourier transform lens in the holographic recording and reproducing apparatus of Chou et al. in view of Tanaka et al. and Bernal et al., for the purpose of optimizing the light throughput of the optical system, while reducing unwanted errors due to optical noise.

(10) Response to Argument

The Appellant's arguments and remarks filed 11/13/07 in response to the final rejection, dated 3/13/07, have been fully considered, however they are not found persuasive.

A) Response to arguments regarding Section 103 rejections on the basis of Chou in view of Curtis and Bernal (See Pages 6-10 of Appellant's brief filed 11/13/07)

It is Appellant's belief that the combined teachings of Chou et al., Curtis et al., and Bernal et al. fail to teach or reasonably suggest a holographic recording and reproducing apparatus, including *a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens… the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens*. (Emphasis added; See Page 6 of Appellant's brief). However, it is the belief of the Examiner that the combined teachings of Chou et al., Curtis et al., and Bernal et al. do teach a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens, the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

As previously stated in Section 9 of the Office Action dated 3/13/07, Chou et al. is drawn to a holographic optical recording and reproducing system that includes a spatial light modulator (See 'SLM' in Figure 1 of Chou et al.), a Fourier transform lens (See 'lens 1' in Figure 1 of Chou et al.), a reverse Fourier transform lens (See 'lens 2' in Figure 1 of Chou et al.), and a CCD image sensor (See 'CCD' in Figure 1 of Chou et al.). Further, a holographic recording medium (See 'memory' in Figure 1 of Chou et al.) is disposed at the confocal point between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform

lens is set to be the same or different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D of Chou et al.); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of information). Since Chou et al. does not explicitly disclose that a pinhole is disposed at the confocal point of the Fourier transform lens and the reverse Fourier transform lens, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, Curtis et al. was cited to evidence the known teaching in the art of holography that the confocal point between the Fourier transform lens and the reverse Fourier transform lens may be shifted away from the location of the holographic recording medium (See for example Figures 6-7, 10-11, 13-15 of Curtis et al.) such that the confocal point may be located either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens (See especially 390/395, 380 in Figure 10; 405/390, 380 in Figure 11 of Curtis et al.). In addition, Bernal et al. was cited to evidence the known teachings in the art of holography that a pinhole aperture (See 'D' in Figure 1 of Bernal et al.) may be utilized at the location of the Fourier plane (i.e. the confocal point of the Fourier transform lens and the reverse Fourier transform lens) of the 4F holographic optical system.

With respect to Appellant's arguments that the combined teachings of Chou et al., Curtis et al., and Bernal et al. fail to teach the limitation of the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic

recording medium and the reverse Fourier transform lens, the Examiner notes that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Further, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, Curtis et al. teaches that that the confocal point between the Fourier transform lens and the reverse Fourier transform lens may be shifted away from the location of the holographic recording medium such that the confocal point may be located either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, instead of directly on the holographic recording medium. This is done to minimize any distortion sensitivity due to recording medium shrinkage (See for example col. 11, line 30-col. 12, line 29 of Curtis et al.). Further, Bernal et al. teaches that that a pinhole aperture may be utilized at the location of the confocal point of the Fourier transform lens and the reverse Fourier transform lens, specifically for the purpose of minimizing crosstalk noise from adjacent multiplexed/recorded holograms in the holographic recording medium (See for example the first paragraph of column 3 of Page 21 of Bernal et al.). Combined, one of ordinary skill in the art of holography may glean that the pinhole aperture, which is located at the confocal point of the Fourier transform lens and the reverse Fourier transform lens, will shift its position in concert

with a shift in the position of the confocal point between the Fourier transform lens and the reverse Fourier transform lens. Further, the Examiner notes that Appellant has misconstrued the structural features of Bernal et al. in stating that "…*either* the holographic recording material *or* the aperture is disposed at the Fourier plane" (See Page 8 of Appellant's brief). In fact, Bernal et al. discloses that both the holographic recording medium and the pinhole aperture are located at the Fourier plane (See 'D' in Figure 1; first paragraph of column 3 of Page 21 of Bernal et al.). It is the teaching of Curtis et al. that allows this confocal point, and hence the position of the pinhole aperture, to be shifted away from the location of the holographic recording medium.

Further, with respect to arguments that the proposed changes to the optical system of Chou et al. would render Chou et al.'s system unsatisfactory for its intended purpose (See Pages 8-9 of Appellant's brief), the Examiner also disagrees. Appellant refers to Pages 6951-6953 of Chou et al., which discusses the various noise contributions that are simulated in studying overall bit-error-rate (BER), and hence number of holographic data pages that can be saved, in a holographic recording medium utilizing the system shown in Figure 1 of Chou et al. Appellant then argues that such random noise must actually be present so as to allow for an analysis of the effect of noise on the data. Though this is true for the simulation, the actual optimized holographic optical system that is designed utilizes all of this simulation data to construct a *minimum* BER holographic optical system, i.e. a holographic optical system that has very little to no random noise so as to maximize the number of holographic data pages that can be saved in the holographic recording medium (See specifically Section 2C on Pages 6954-6956 of Chou et al.). Thus, contrary to Appellant's assertion, changes to the optical system to minimize any randomized noise components, such as by placement of an aperture at the confocal point of the

Fourier and reverse Fourier lenses as taught by Bernal et al., to maximize storage capacity of the holographic recording medium are contemplated by the teachings disclosed by Chou et al., and hence would not render the system unsatisfactory for its intended purpose.

Finally, with respect to arguments (See Pages 9-10 of Appellant's brief) that the Examiner has ignored portions of the teachings in Chou et al., Curtis et al., and Bernal et al., that 'teach away' from the claimed subject matter or otherwise argue against obviousness, the Examiner specifically notes that Appellant has failed to specifically and distinctly point out where in each or all of the Chou et al., Curtis et al., and Bernal et al. references that *either* the holographic recording material *or* the aperture is disposed at the Fourier plane. As previously noted, Bernal et al. explicitly discloses that that both the holographic recording medium and the pinhole aperture may be located at the Fourier plane (See 'D' in Figure 1; first paragraph of column 3 of Page 21 of Bernal et al.). In addition, the Examiner notes that it is the combined teachings of Chou et al., Curtis et al., and Bernal et al., and specifically that of Curtis et al. and Bernal et al., which evidence that the confocal point, and hence the position of the pinhole aperture, may be shifted away from the location of the holographic recording medium, so that both the confocal point and the pinhole aperture may be located either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

B) Response to arguments regarding Section 103 rejections on the basis of Chou in view of Tanaka and Bernal (See Pages 10-15 of Appellant's brief filed 11/13/07)

It is Appellant's belief that the combined teachings of Chou et al., Tanaka et al., and Bernal et al. fail to teach or reasonably suggest a holographic recording and reproducing

apparatus, including *a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens… the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens*. (Emphasis added; See Page 10 of Appellant's brief). However, it is the belief of the Examiner that the combined teachings of Chou et al., Tanaka et al., and Bernal et al. do teach a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens, the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

As previously stated in Section 11 of the Office Action dated 3/13/07, Chou et al. is drawn to a holographic optical recording and reproducing system that includes a spatial light modulator (See 'SLM' in Figure 1 of Chou et al.), a Fourier transform lens (See 'lens 1' in Figure 1 of Chou et al.), a reverse Fourier transform lens (See 'lens 2' in Figure 1 of Chou et al.), and a CCD image sensor (See 'CCD' in Figure 1 of Chou et al.). Further, a holographic recording medium (See 'memory' in Figure 1 of Chou et al.) is disposed at the confocal point between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform lens is set to be the same or different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D of Chou et al.); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of information). Since Chou et al. does not explicitly disclose that a pinhole is disposed at the confocal point of the Fourier transform

lens and the reverse Fourier transform lens, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, Tanaka et al. was cited to evidence the known teaching in the art of holography that the confocal point between the Fourier transform lens and the reverse Fourier transform lens may be shifted away from the location of the holographic recording medium (See for 10 in Figure 9 of Tanaka et al.) such that the confocal point is located between the holographic recording medium and the Fourier transform lens (See for example focal point of elements 13, 21 near element 50 in Figure 9 of Tanaka et al.). In addition, Bernal et al. was cited to evidence the known teachings in the art of holography that a pinhole aperture (See 'D' in Figure 1 of Bernal et al.) may be utilized at the location of the Fourier plane (i.e. the confocal point of the Fourier transform lens and the reverse Fourier transform lens) of the 4F holographic optical system.

With respect to Appellant's arguments that the combined teachings of Chou et al., Tanaka et al., and Bernal et al. fail to teach the limitation of the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, the Examiner notes that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Further, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references

would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, Tanaka et al. teaches that that the confocal point between the Fourier transform lens and the reverse Fourier transform lens may be shifted away from the location of the holographic recording medium such that the confocal point may be located between the holographic recording medium and the Fourier transform lens, instead of directly on the holographic recording medium. This is done to minimize any distortion sensitivity due to recording medium shrinkage (as previously evidenced by Curtis et al.). Further, Bernal et al. teaches that that a pinhole aperture may be utilized at the location of the confocal point of the Fourier transform lens and the reverse Fourier transform lens, specifically for the purpose of minimizing crosstalk noise from adjacent multiplexed/recorded holograms in the holographic recording medium (See for example the first paragraph of column 3 of Page 21 of Bernal et al.). Combined, one of ordinary skill in the art of holography may glean that the pinhole aperture, which is located at the confocal point of the Fourier transform lens and the reverse Fourier transform lens, will shift its position in concert with a shift in the position of the confocal point between the Fourier transform lens and the reverse Fourier transform lens. Further, the Examiner notes that Appellant has misconstrued the structural features of Bernal et al. in stating that "…*either* the holographic recording material *or* the aperture is disposed at the Fourier plane" (See Page 11 of Appellant's brief). In fact, Bernal et al. discloses that both the holographic recording medium and the pinhole aperture are located at the Fourier plane (See 'D' in Figure 1; first paragraph of column 3 of Page 21 of Bernal et al.). It is the teaching of Tanaka et al. that allows this confocal point, and hence the position of the pinhole aperture, to be shifted away from the location of the holographic recording medium.

In addition, the Examiner respectfully disagrees with Appellant's assertion that the Examiner has interpreted the limitation of 'a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens, the pinhole being disposed between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens' as being two separate limitations. The Examiner acknowledges and agrees that these limitations are interrelated, and it is the belief that the additional teachings of both Tanaka et al. and Bernal et al., taken in combination with the teachings of Chou et al., exhibit this interrelationship between these limitations. The Examiner again reiterates, as previously stated above, that 1) Tanaka et al. teaches that that the confocal point between the Fourier transform lens and the reverse Fourier transform lens may be shifted away from the location of the holographic recording medium such that the confocal point may be located between the holographic recording medium and the Fourier transform lens, instead of directly on the holographic recording medium, and 2) Bernal et al. teaches that that a pinhole aperture may be utilized at the location of the confocal point of the Fourier transform lens and the reverse Fourier transform lens. Thus, these combined teachings evidence that the confocal point, and hence the position of the pinhole aperture which is located at the confocal point as taught by Bernal et al., may be shifted away from the location of the holographic recording medium, so that both the confocal point and the pinhole aperture may be located between the holographic recording medium and the Fourier transform lens, as taught by Tanaka et al.

Further, with respect to arguments that the proposed changes to the optical system of Chou et al. would render Chou et al.'s system unsatisfactory for its intended purpose (See Pages 13-14 of Appellant's brief), the Examiner also disagrees. Appellant refers to Pages 6951-6953 of

Chou et al., which discusses the various noise contributions that are simulated in studying overall bit-error-rate (BER), and hence number of holographic data pages that can be saved, in a holographic recording medium utilizing the system shown in Figure 1 of Chou et al. Appellant then argues that such random noise must actually be present so as to allow for an analysis of the effect of noise on the data. Though this is true for the simulation, the actual optimized holographic optical system that is designed utilizes all of this simulation data to construct a *minimum* BER holographic optical system, i.e. a holographic optical system that has very little to no random noise so as to maximize the number of holographic data pages that can be saved in the holographic recording medium (See specifically Section 2C on Pages 6954-6956 of Chou et al.). Thus, contrary to Appellant's assertion, changes to the optical system to minimize any randomized noise components, such as by placement of an aperture at the confocal point of the Fourier and reverse Fourier lenses as taught by Bernal et al., to maximize storage capacity of the holographic recording medium are contemplated by the teachings disclosed by Chou et al., and hence would not render the system unsatisfactory for its intended purpose.

Finally, with respect to arguments (See Pages 14-15 of Appellant's brief) that the Examiner has ignored portions of the teachings in Chou et al., Tanaka et al., and Bernal et al., that 'teach away' from the claimed subject matter or otherwise argue against obviousness, the Examiner specifically notes that Appellant has failed to specifically and distinctly point out where in each or all of the Chou et al., Tanaka et al., and Bernal et al. references that a clear and unambiguous teaching that *either* the holographic recording material *or* the aperture is disposed at the Fourier plane. As previously noted, Bernal et al. explicitly discloses that that both the holographic recording medium and the pinhole aperture may be located at the Fourier plane (See

'D' in Figure 1; first paragraph of column 3 of Page 21 of Bernal et al.). In addition, the Examiner notes that it is the combined teachings of Chou et al., Tanaka et al., and Bernal et al., and specifically that of Tanaka et al. and Bernal et al., which evidence that the confocal point, and hence the position of the pinhole aperture, may be shifted away from the location of the holographic recording medium, so that both the confocal point and the pinhole aperture may be located either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens.

C) Response to arguments regarding Examiner's refusal to enter an amendment removing claim language rejected solely under 35 U.S.C. 112, 1st paragraph (See Pages 15-16 of Appellant's brief filed 11/13/07)

As per MPEP § 1002 and § 1201, entry of an after-final amendment is a petitionable matter, and not an appealable matter. Irrespective of Appellant's arguments and remarks made on Pages 15-16 of Appellant's brief, a petition to enter an after-final amendment dated 7/25/07 was granted, and thus these arguments and remarks are now moot.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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